

ECOSYSTEM STATUS INDICATORS***Nutrients and Productivity***

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Nutrient and Chlorophyll Processes on the Gulf of Alaska Shelf

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The northern Gulf of Alaska shelf is a productive coastal region that supports several commercially important fisheries. The mechanisms supporting such high levels of productivity over this shelf however are not understood since it is a downwelling-dominated shelf. Furthermore, the annual nutrient cycle in this region was completely unknown prior to this research. In an effort to understand the mechanisms driving such high biological productivity cross-shelf nutrient distributions were sampled by the GLOBEC Long-term Observation Program (LTOP) 18 times throughout 1998, 1999 and 2000. Deep water (>75 m) nitrate, silicate and phosphate were positively correlated with salinity indicating an offshore nutrient source. The average annual cycle was established, in which nitrate, silicate and phosphate responded seasonally to physical and biological processes. Ammonium concentrations were generally low and uniform (<1.2 μM) with occasional patches of higher concentrations. Throughout the summer months, the upper 10-20 m across shelf was depleted of nitrate, silicate and phosphate over the inner and middle shelves and depleted of nitrate and phosphate over the shelf break and slope; however, just below this nutrient-poor layer the water column was nutrient-replete. During each summer, there was an onshore flux of dense nutrient-rich bottom water onto the shelf when the downwelling relaxed. This seasonal flux created a nutrient reservoir near the bottom of the inner and middle shelves. The reservoir was eventually mixed throughout the water column during the winter months. This annual evolution may be vital to the productivity of this shelf. There was a large degree of interannual variability among the three years, which included El Niño (1998) and La Niña (1999) years. Nutrient concentrations and phytoplankton chlorophyll biomass were generally highest in 2000, except in May 1999, when a large eddy traveling along the continental slope greatly enhanced phytoplankton chlorophyll biomass. Daily new production estimates based on nitrate disappearance averaged over the spring-summer season ranged from 2.46-6.97 $\text{mmol nitrate m}^{-2} \text{ day}^{-1}$. Analysis of the LTOP data continues and will be updated with the final 2004 field season information.